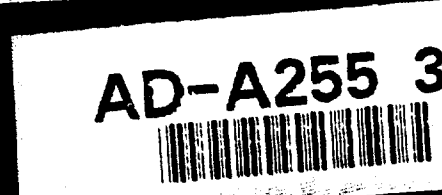

ASVAB SCORE AS A PREDICTOR OF ACADEMIC SUCCESS IN SONAR TECHNICIAN "A" SCHOOL

A Report
presented to
the Faculty of the School of Education
San Diego State University

In Partial Fulfillment
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CHAPTER I

INTRODUCTION

The Navy's Sonar Technician (ST) "A" Schools are taught at Fleet Anti-Submarine Warfare Training Center, Pacific, San Diego, CA (FLEASWTRACENPAC). The surface (STG) version is a five-week class, and the submarine (STS) version of the school is a nine-week course. According to Don Alford, FLEASWTRACENPAC's Education Specialist, each course costs the Navy approximately $1000 per student per week . Over 1000 sailors attend ST "A" School each year. The Armed Services Vocational Aptitude Battery (ASVAB) is a standardized test administered to all prospective enlisted personnel upon entering the Navy (Commander, Naval Recruiting Command [COMNAVCRUITCOM], 1988). Selection to either Sonar Technician "A" School depends on a sailor's achieving predetermined scores on selected sections of the ASVAB, as well as meeting other physical and security-related criteria (NAVPERS, 1990). These selection criteria are determined by the Chief of Naval Personnel and are published in the Enlisted Transfer Manual. Those students who are dropped from their "A" School for academic reasons are either ordered to another training program or sent to a ship for general assignment, for they must still fulfill their obligated service as specified by their contract (NAVPERS, 1989). If the ASVAB is not an accurate predictor of academic success in technical "A" Schools, sailors may be

inappropriately assigned to the schools, which could result in a tremendous financial loss to taxpayers and to the Navy (Macklem, 1990; Weltin, 1983). Academic success is defined as earning a final grade point average (GPA) of at least 70%. Scores are determined by performance on all written and practical tests administered throughout the course.

Statement of the Problem

The Enlisted Transfer Manual delineates the qualifications required for entrance to the Navy's Advanced Electronics Field (AEF) Program, which includes Sonar Technicians. The Enlisted Personnel Management Command (EPMAC) uses these standards to select personnel for class "A" Schools. All ST candidates, both Surface (STG) and Submarine (STS), must be high school graduates or the equivalent. They must be U.S. citizens and be eligible for a security clearance based on a background investigation. They must also have normal color perception and hearing. They need minimum ASVAB composite scores of MK + EI + GS = 156 and MK + EI + GS + AR = 218. In addition, STS candidates must have ASVAB composite scores of WK + AR + MC $\geq$ 147, with a minimum WK of 41. Sailors may request a retest of the ASVAB if at least one year has passed since the original test and they have improved their ability by completing formal training or a Navy correspondence course. Sailors who fail to meet the minimum ASVAB scores to qualify for "A" school may request a waiver under extraordinary circumstances (USMEPCOM, 1985). Chief of Naval Personnel

(1991) modified STG criteria to include minimum MK and AR scores of 57, effective 1 December 1991, but these criteria were not applicable to the subjects of this study.

This study included sailors who attended either the Surface or Submarine versions of Sonar Technician "A" School and who either graduated successfully or were dropped from school for academic reasons. It did not include those students who were dropped from school for medical, legal, or administrative reasons.

Research Questions

This study involved two research questions:

1. What is the relationship between ASVAB score and final GPA in Sonar Technician (Surface) "A" School?

2. What is the relationship between ASVAB score and final GPA in Sonar Technician (Submarine) "A" Scnool?

Significance of the Study

Determining whether or not there is a statistically significant relationship between ASVAB score and academic success in Sonar Technician "A" School will either support or reject the current criterion for selection to that school. This will enable EPMAC to more accurately predict a candidate's potential for successfully completing ST "A" School.

If there is a significant relationship between ASVAB composite score and academic success in ST "A" School, the minimum ASVAB score required for selection to the school may be raised in order to help lower attrition due to academic

failure. If there is a significant relationship between one or more ASVAB subtests and academic success in ST "A" School, the weighting of the subtests as used for selection may be amended. If no statistically significant relationship exists between ASVAB score and successful completion of ST "A" School, the minimum scores required for selection may be lowered or another selection criterion may be substituted for the ASVAB.

Assumptions

For the purpose of this study, it was assumed that the sailors put forth their best effort when taking the ASVAB as well as when taking the written and practical tests during ST "A" School.

Definition of Terms

1. "A" School: A Navy school providing basic training in any of the Navy's specialized fields, including electronics, technical, nuclear, aviation, or submarine specialties. "A" schools range from four to 71 weeks in length. Navy detailers assign "A" School graduates to billets designated by their new rating (eg. STG, STS). These billets build upon their newly acquired knowledge.

2. Armed Services Vocational Aptitude Battery (ASVAB): An instrument used by the United States Navy, Army, Air Force, and Marines to select personnel for enlistment and for specialized training programs. The ASVAB is also used by many high school counselors to provide occupational counseling for their students. It consists of 11 sections:

- General Sciences (GS),
- Arithmetic Reasoning (AR),
- Word Knowledge (WK),
- Paragraph Comprehension (PC),
- Numerical Operations (NO),
- Coding Speed (CS),
- Auto and Shop Information (AS),
- Mathematics Knowledge (MK),
- Mechanical Comprehension (MC),
- Electronics Information (EI), and
- Verbal (VE)

(Chief of Naval Personnel [NAVPERS], 1989; U.S. Military Entrance Processing Command [USMEPCOM], 1989).

3. Enlisted Personnel: Also called sailors, these are personnel who enter into an employment contract with the U.S. Navy and agree to serve in the Navy for a specified number of months, often in exchange for a guaranteed assignment or training program (most often an "A" School).

4. Sonar Technician "A" School: Two versions of this school are taught at Fleet Anti-Submarine Warfare Training Center, Pacific, San Diego, CA (FLEASWTRACENPAC): (a) Sonar Technician (Surface), and (b) Sonar Technician (Submarine). These schools provide comprehensive training for sonar technicians (STs) who will be assigned to surface ships or submarines, respectively. Sonar Technician (Surface) is a five-week course of study and Sonar Technician (Submarine) is a nine-week school. The curriculum for each includes

theory, operation, and maintenance of sonar equipment. Students who graduate from ST "A' School earn the rating STG (surface) or STS (submarine). This rating determines future duty assignments for the sailors, for Navy detailers will send them to billets that use their specialized sonar technician skills.

CHAPTER II

LITERATURE REVIEW

Historical Background

Nearly all post-secondary training programs have a screening process for enrollment, including the military. Selection officials try to identify those candidates who are most likely to succeed in their program. Predicting that success, however, is complex, and the actual selection criteria varies considerably among organizations and schools. Aptitude testing is the subject of much research and debate, in both theoretical and operational contexts. Proponents assert that assessment testing: (a) closely approximates real-life because it uses job-related simulations, (b) has precision and depth, (c) is valid and reliable, (d) directly identifies training needs, and (e) allows participants to recognize the fairness of the technique in assessing their abilities. In a litigation-conscious society, organizations can better defend selections based on an objective assessment process. Testing, however: (a) is expensive, (b) requires large investments of time, and (c) contains participant risk. Information taken out of context or mishandled can have a long-term effect on a person's career (Coleman, 1987).

Aptitude tests have been used for training and employment selection in the U.S. since the early 1900's when the Boston Elevated Railway was the first American company to create a formal testing program for personnel selection.

Early research concentrated on the validation of testing techniques, resulting in better correlation between test prediction and performance (Ghiselli, 1966). Most of the early tests were strictly academic in nature. The Office of Strategic Service developed the first comprehensive assessment centers during World War II to test potential candidates. Assessment centers use a variety of work simulation testing techniques to allow candidates to demonstrate the skills most essential for success in a given training program or job, in addition to academic acumen. Despite the program's overwhelming success, it was several years before private industry enjoyed widespread use of the assessment technique. AT&T conducted the primary study on assessment centers in 1956, focusing on the selection and development of junior management staff. They concluded that the benefits were significant, as did the drove of other major corporations who studied the concept after AT&T. Assessment centers thus became accepted as the ultimate technique for accurately predicting a candidate's performance for training programs.

Several standardized tests have been shown to provide reliable information about a candidate's aptitude for academic programs. The Scholastic Aptitude Test (SAT), American College Test (ACT), and National Merit Scholarship Qualifying Test (NMSQT) are the most common. High school counselors use these three tests extensively in helping students choose post-secondary education programs. Colleges

and universities use the SAT, ACT, and NMSQT to select the most promising candidates for their schools, often using them in combination with high school grade point average rather than relying on a single score (Astin, 1971; Macklem, 1990).

Actual performance in a program is a function of many situational factors,including environment, stress from outside sources, and interpersonal relationships. Therefore, a person's performance is only partially due to abilities and personality traits. Social controversy and legal debate about the appropriateness of predictive testing continues. Opponents argue that cutoff scores often tend to ignore the importance of the variety of items on a test. Instead of using cutoff scores, it is better to rank the candidates' scores from highest to lowest and fill quotas from the top of the list, for this provides a more efficient use of the manpower and talent available (CA State Board of Corrections, 1987). Numerous studies on the relationship between test scores and factors such as age, race, and gender have produced mixed conclusions about the possibility of discrimination against identifiable groups (Manese, 1986; Subcommittee on Civil and Constitutional Rights of the Committee on the Judiciary, 1989; Swarthout & Synk, 1987). Standardized tests are not suitable for valid prediction in all situations (Richter, 1968; Thorndike, 1985). Even tests with accepted validity have limits to their predictive ability, and must be used carefully to preserve their

integrity (Jacobsen & Borchardt, 1980; Suddick & Collins, 1984; Wright, Reilly, & Lytle, 1990).

Despite the controversy, assessment tests are more widely used than ever before, and development of better testing techniques remains a priority for many organizations and institutions. Research intended to validate an existing test sometimes leads to the modification or even elimination of the test (Westbrook, Sanford, & Donnelly, 1990). An ever-increasing number of tests consider the range of differences in language, culture, and literacy inherent in the population of potential candidates (Employment and Training Administration, 1982). Modern assessment centers may employ an extensive array of evaluation methods including academic, personality and skill tests as well as personal interviews and recommendations in order to select personnel (Leiken, & Cunningham, 1980). It is estimated that billions of dollars in training and labor costs are saved by companies and training institutions each year and special administrative problems are greatly reduced through the use of assessment testing (U.S. Department of Labor, 1983).

Assessment Test Criteria

To create a valid predictor of performance, first the skills of the actual job or program must be identified and broken into components (Weeks, 1981). Tests are classified as those examining (a) intellectual abilities, such as intelligence and memory; (b) spatial and mechanical

abilities, such as spatial relations and mechanical principles; (c) perceptual accuracy, such as name comparison and cancellation skills; (d) motor abilities, such as finger, hand, or arm dexterity; and (e) personality traits, such as motivation and interest (Ghiselli, 1966). In most cases, no single criterion can be used as the sole predictor of success in a job or program (Leiken & Cunningham, 1980; Longenbecker & Wood, 1984). Several traits or skills often combine to form the best predictors. The individual traits considered might be weighted as well, to account for differences in importance or predictor ability of a given skill or trait (Belcher, 1989; Westbrook, Sanford, & Donnelly, 1990).

Research has shown that the most accurate assessment tests have: (a) comprehensive formats, (b) problem-solving sections, and (c) flexible question order, based on previous performance (Hambleton, Gower, & Bollwark 1988). Computerized adaptive testing (CAT) appears to accommodate all three of these characteristics, and several CAT programs are currently being developed and tested (Knapp & Pliske, 1986; Schratz, 1986). While mental ability tests are the best overall indicators of success for most programs, other important considerations are: (a) past experience and performance, (b) skills specific to the task at hand, and (c) individual attributes such as motivation and personality traits (Croft & Gilmore, 1986; Thomson & Mageean, 1987). Instruments that identify and evaluate non-intellectual

variables such as the Work Values Inventory and Self-Directed Search are being more closely examined for their predictive value, as well (Rowe, & Smith, 1990). Correlation of test items with identified criteria is vital to test reliability (Ary, Jacobs, & Razavieh, 1990).

The ASVAB

One of the foremost authorities in assessment testing research and development is the U.S. Department of Defense (Diessner, 1985; Weltin & Popelka, 1983). The Army Research Institute for the Behavioral and Social Sciences (1985) conducted research that led to the construction of the most comprehensive array of job performance criteria in the history of personnel classification and research. The Armed Services Vocational Aptitude Battery is one of the most widely used counseling and selection tools in the United States. It is a mainstay of high school counselors as well as the primary criterion for selection of enlisted personnel to training programs in all branches of the armed forces. Approximately 1 million students from about 14,000 schools take the ASVAB annually (USMEPCOM, 1985, 1989).

The Selective Service Act of 1948 mandated the development of a standard test to screen enlisted candidates to all branches of the U.S. Armed Forces. Until then each service had used separate screening tests. The new joint-service test was called the Armed Forces Qualification Test (AFQT), and was first used in 1950. Each service continued to use its own aptitude test batteries to select recruits

for technical schools or on-the-job training, however. In 1958, the Air Force introduced the Airman Qualifying Test (AQT), an abbreviated version of their enlisted classification test. They administered the AQT to high school students to boost recruiting efforts and to help students with career exploration and decision-making. Soon the Navy and Army produced shortened versions of their classification batteries for high school use as well.

In 1968 the ASVAB was developed as a joint military test battery, replacing the individual service tests. Extensive field tests are continuously conducted on all aspects of the ASVAB, and 14 different forms of the tests have been produced. Research results are used to refine measuring techniques, and training materials are constantly revised as dictated by the data collected. As a result, the ASVAB has been repeatedly validated as a predictor of success in a myriad of training programs (Commander, Naval Recruiting Command, 1988; Horne, 1986). The ASVAB is periodically revised in order to decrease compromise, replace obsolete items, and make other improvements. These changes occur only after comprehensive research has established the reliability of the revised tests (Palmer, Hartke, Ree, Welsh, & Valentine, 1988).

Sonar Technician "A" School

Commander, Naval Education and Training (CNET) publishes a Personnel Performance Profile Table for every skill required in a Navy rating. These tables are updated

annually, to reflect the dynamic nature of the jobs. To develop a course such as ST "A" School, FLEASWTRACENPAC's Curriculum Department first conducts a front-end analysis of the training need. Building on that analysis, they extract applicable portions of CNET's Personnel Performance Profile Tables and turn the line items into course objectives. These objectives form the basis for the course content and Lesson Training Guide (LTG) each instructor follows. Instructors attend Instructor Training as well as training on the specifics of the course they are going to teach. The LTG provides detailed guidelines both for course content but also for teaching technique and supplementary information.

Once a candidate is selected for ST "A" School, either Surface or Submarine, the staff of FLEASWTRACENPAC makes every effort to ensure the student's successful completion of the school. Comprehensive instructions guide the monitoring, counseling, and remediation processes. FLEASWTRACENPACINST 1540.39C (1990) requires that a student who fails any test or exhibits borderline performance be counseled and assigned to mandatory, remedial study. After being given a reasonable amount of time to improve, the student is retested. Failure of a retest or other evidence of poor academic performance leads to evaluation by the Academic Review Board, described in FLEASWTRACENPACINST 1540.1B (1991). The Board has several options: (a) disenroll the student, (b) place him on academic probation, (c) set him back to another class to repeat the

course, (d) enroll him in another course, (e) enroll him in a tailored remedial instruction program, or (f) refer him for special counseling and assistance. Disenrolling a student is the last resort, when all efforts to help him succeed academically have failed.

Validity

Properly designed and administered assessment tests provide an accurate prediction of success in training and a fair basis for candidate selection. The military has conducted extensive research on the validity of the ASVAB. While correlation coefficients vary considerably for various specific programs, the overall assessment is that the ASVAB accurately predicts performance in a myriad of training programs. ASVAB-14 is the most current form of the test, and its composite scores have median coefficients of over .60 for predicting performance in more than 50 military technical training programs. Further, a joint-service study has been underway since 1981 to measure on-the-job performance in the military. Preliminary results indicate that the ASVAB predicts job performance about as well as it predicts military training performance (USMEPCOM, 1985).

There has also been considerable civilian research of the ASVAB's validity. Empirical data from two sources supports ASVAB-14's validity for civilian occupations: (a) validity generalization (Hunter, Schmidt, & Jackson, 1982), and (b) a study that linked military occupations to their civilian occupational counterparts. This study found

civilian counterparts for approximately 80% of enlisted occupational specialities (U.S. Department of Defense, 1986). Validity coefficients of the ASVAB have also been compared to those of the General Aptitude Test Battery (GATB) used by the U.S. Employment Service. The GATB has long been accepted as a valid indicator of civilian job performance. Hunter (1983) demonstrated that the ASVAB and GATB were psychometrically equivalent and therefore concluded that the GATB's validity could be used to infer the ASVAB's ability to predict performance as well.

The Air Force and Army have reported separate validation data for males and females, and for Blacks and Whites who took ASVAB forms 8, 9, or 10. For those occupations for which sufficient data was available, no significant gender or race differences existed in predictions made upon ASVAB scores (Fast & Martin, 1984). Bock and Moore (1984) found no evidence that the ASVAB caused gender or race bias in the selection to 43 different Air Force technical training schools.

CHAPTER III

METHOD

Introduction

This correlational study compared sailors' preadmittance ASVAB scores with their final GPA in Sonar Technician (Surface or Submarine) "A" School. Both composite scores and individual subtest scores were compared to the GPA. By demonstrating whether there is a significant correlation between a student's ASVAB score and his academic performance in ST "A" School, better prediction of success in that school is made possible.

Selection requirements other than ASVAB scores were not examined during this study. Security clearance considerations, vision and hearing parameters, and additional qualifications for the Submarine and Personnel Reliability programs were not included in the data. Neither exceptional circumstances nor qualifications cited in a sailor's request for a waiver of the prerequisites were considered.

Sample Selection

The accessible population was all sailors who have attended Sonar Technician "A" Schools, both Surface and Submarine, between October 1989 and October 1991. It included all students who graduated from "A" School as well as those who were dropped from school for academic reasons. It did not include sailors who were dropped from school for medical, legal, or administrative reasons. The accessible

population totalled approximately 1500 sailors. All of these 1500 students were males, for the school is closed to females (NAVPERS, 1990). Their ages ranged from 19 to 36. For this study, 435 graduates were randomly selected from each of the ST "A" Schools. During the two-year period considered, there were 29 students dropped for academic reasons from the STG "A" School and 22 from the STS "A" School. Due to the small numbers, all of these academic drops were included in the study, in addition to the 435 from each school. This resulted in 464 STG and 457 STS students for the statistical analysis.

Instrument

The raw data for this research already existed, so no new instrument was constructed. Class rosters are created by the Enlisted Training Department at FLEASWTRACENPAC for each Sonar Technician class they conduct. The rosters include each student's name, social security number, and final grade point average. They are kept on file in the Personnel Support Activity Detachment, Fleet Anti-Submarine Warfare Training Center, Pacific (PERSUPPDET FLEASWTRACENPAC) for two years after course completion. ASVAB scores are found in the Navy's Source Data System (SDS). SDS is a computerized file of personnel records. By entering a sailor's social security number, the ASVAB score can be retrieved. This computer system is accessible through the PERSUPPDET as well. (Note: Social Security numbers are protected by the Privacy Act of 1974. They were

used only to retrieve ASVAB scores from SDS and to match them with the corresponding grade point average. They were then deleted from the data.)

ASVAB tests are standardized tests administered in accordance with Department of Defense instructions (USMEPCOM, 1985). Scores are reported as percentage correct on individual sections of the test as well as composites. Final GPA in Sonar Technician "A" School is determined by performance on a series of written and practical examinations administered during the course. These examinations are created by Navy educational specialists and administered in accordance with Navy training directives. For each course objective, the education specialists construct one to three questions for a test bank. They test the questions for validity and discrimination before accepting them for the bank. When an instructor requests an examination, questions are randomly chosen from the bank (D. Alford, personal communication, December 2, 1991). When the course is developed, a Test Plan is also written, providing instructors with detailed information about what skills and knowledge will be tested and how it will be done (Commanding Officer, Fleet Anti-Submarine Warfare Training Center, Pacific [FLEASWTRACENPAC], 1990a). Scores are reported as percentage correct.

Procedures

Approval to conduct the study was obtained from Commanding Officer, FLEASWTRACENPAC and Commanding Officer,

Personnel Support Activity, San Diego (PERSUPPACT San Diego). Authorization to use the SDS computers was obtained from the Officer in Charge, PERSUPPDET FLEASWTRACENPAC. Class rosters were collected for all STG and STS "A" Schools convening between October 1989 and the June 1991. ASVAB scores were retrieved from SDS for all students on those rosters. The data was analyzed for correlation and the results reported.

Data Analysis

Fifteen hypotheses were tested:

- There is a positive relationship between the ASVAB score of Mathematics Knowledge (MK) and final GPA in Sonar Technician (Surface) "A" School.
- There is a positive relationship between the ASVAB score of Electronics Information (EI) and final GPA in Sonar Technician (Surface) "A" School.
- There is a positive relationship between the ASVAB score of General Sciences (GS) and final GPA in Sonar Technician (Surface) "A" School.
- There is a positive relationship between the ASVAB score of Arithmetic Reasoning (AR) and final GPA in Sonar Technician (Surface) "A" School.
- There is a positive relationship between the ASVAB composite score of Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + GS) and final GPA in Sonar Technician (Surface) "A" School.

- There is a positive relationship between the ASVAB composite score of Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR) and final GPA in Sonar Technician (Surface) "A" School.

- There is a positive relationship between the ASVAB score of Mathematics Knowledge (MK) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB score of Electronics Information (EI) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB score of General Sciences (GS) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB score of Arithmetic Reasoning (AR) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB score of Word Knowledge (WK) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB score of Mechanical Comprehension (MC) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB composite score of Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + GS) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB composite score of Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR) and final GPA in Sonar Technician (Submarine) "A" School.

- There is a positive relationship between the ASVAB composite score of Word Knowledge + Arithmetic Reasoning + Mechanical Comprehension (WK + AR + MC) and final GPA in Sonar Technician (Submarine) "A" School.

ASVAB scores and final GPA are all interval data. The data sets were analyzed for STG and STS "A" Schools separately, and distribution information was reported. The Pearson Product-Moment Correlation Coefficient was calculated for final GPA against each ASVAB subtest as well as against the composite scores. StatView 512+™ was used to perform the statistical analysis. The various ASVAB scores were graphed against GPA for the two schools.

When a student is academically dropped from school, no GPA is recorded for him. Therefore, academic drops were considered separately from the graduates, and only distribution information was reported, as no correlation was possible.

Limitations

Internal validity may have been compromised by maturation. The time lapse between ASVAB administration and "A" School convening may vary from six months to several years for different sailors. It may also have been affected

by instrumentation. Although test administration is governed by Department of Defense and Navy instructions, variance may exist among individual instructors in administration of both the ASVAB and "A" School tests. External validity may have been affected by differences in "A" School instruction among classes and instructors. It may also be affected by changes to the ASVAB or to ST "A" School testing procedures in the future.

The greatest threat to the study's validity was the fact that no GPA exists for those students who were academically dropped from ST "A" School. Therefore, they could not be included with the graduates for the correlation portion of the analysis. They were, however, inserted separately for comparison of the distribution information.

CHAPTER FOUR

RESULTS

Introduction

This research was conducted to calculate if there was a statistically significant correlation between a sailor's ASVAB scores and his academic success in Sonar Technician "A" School. The Pearson Product-Moment Correlation Coefficient was calculated for final GPA against each ASVAB subtest as well as against the composite scores. The t-statistic was then calculated. The data was analyzed for STG and STS "A" Schools separately, and distribution information was recorded. Each ASVAB subtest score was graphed against GPA for the two schools, as were the selected composite scores. Academic drops were considered separately from the graduates, since no final GPA is recorded for them. The goal was to see if the ASVAB is a useful predictor of academic success in the ST "A" Schools, and should continue to be used as selection criteria to those schools.

For reporting the results, STG "A" School will be considered first, followed by STS "A" School.

Findings (STG)

The findings will be reported by hypothesis.

- There is a positive relationship between the ASVAB score of **Mathematics Knowledge (MK)** and final GPA in Sonar Technician (Surface) "A" School.

Table 1

MK of STG Graduates

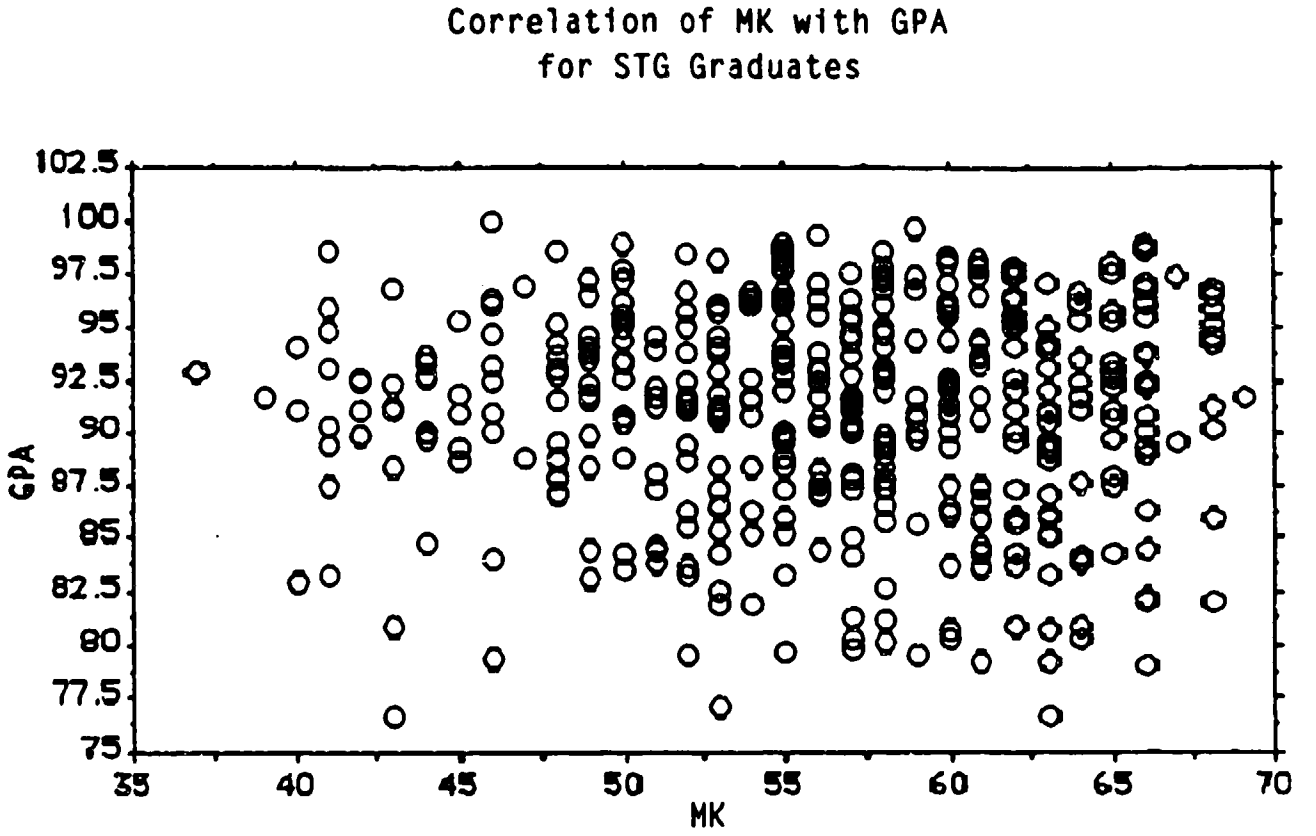
Min	Max	Mean	Std Dev	Corr (r)	t
37	69	56.356	6.958	8.5E-3	0.166

Table 2

MK of STG Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
39	66	53.517	6.283	.	.

Figure 1


Correlation of MK with GPA
for STG Graduates
GPA
102.5
100
97.5
95
92.5
90
87.5
85
82.5
80
77.5
75
35
40
45
50
55
60
65
70
MK

• There is a positive relationship between the ASVAB score of **Electronics Information (EI)** and final GPA in Sonar Technician (Surface) "A" School.

Table 3

EI of STG Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
36	68	58.26	6.057	.326	7.178

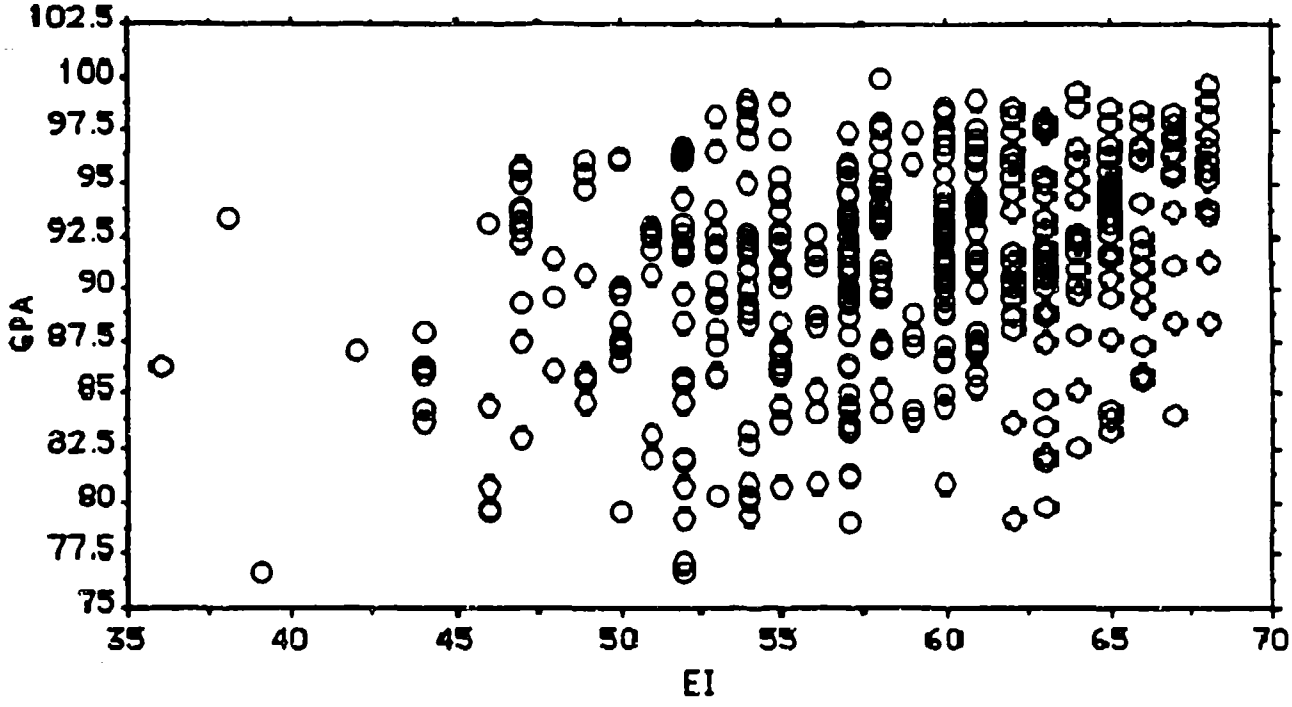
Table 4

EI of STG Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
41	65	55.759	5.423	•	•

Figure 2

Correlation of EI with GPA
for STG Graduates



- There is a positive relationship between the ASVAB score of **General Sciences (GS)** and final GPA in Sonar Technician (Surface) "A" School.

Table 5

GS of STG Graduates

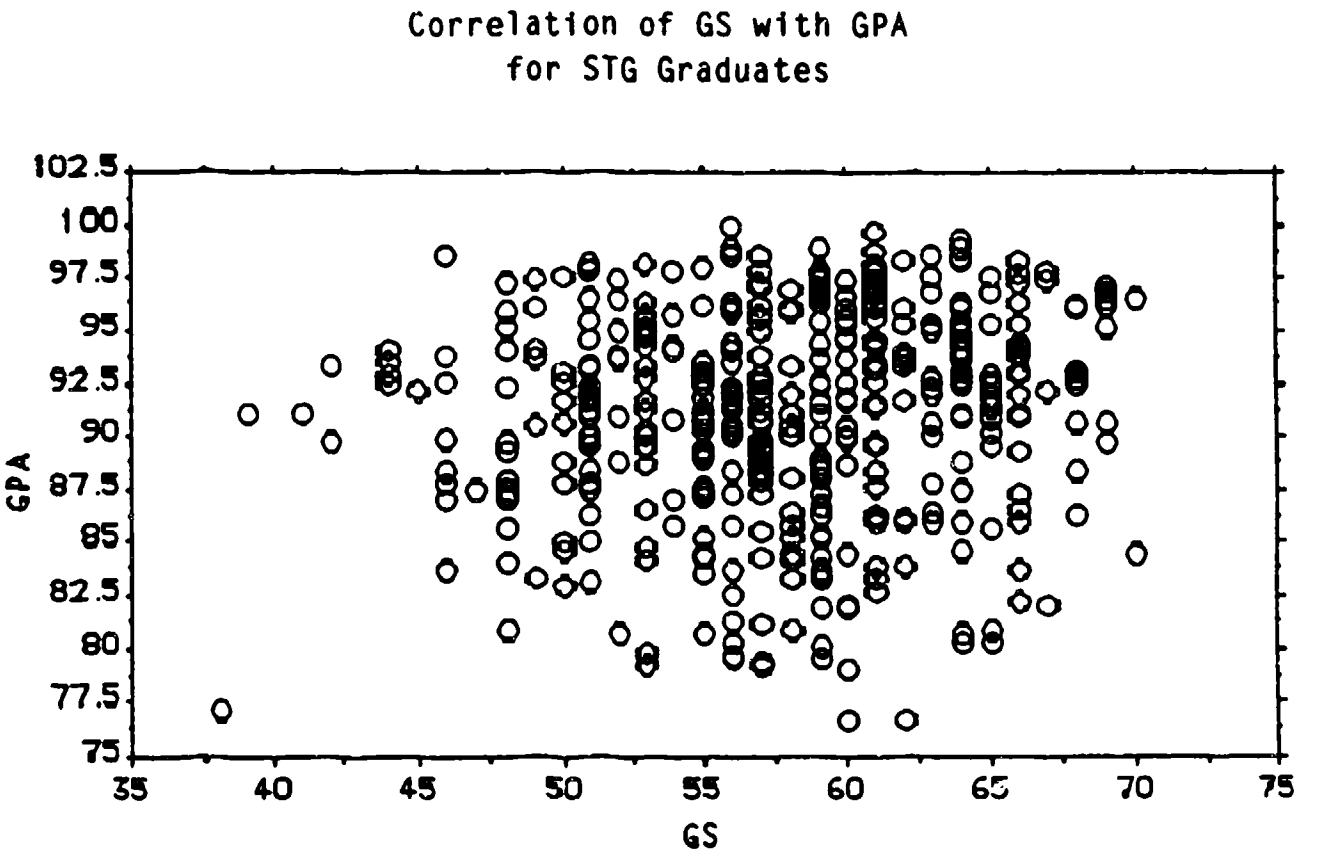
Min	Max	Mean	Std Dev	Corr (r)	t
38	70	57.77	5.976	.117	2.452

Table 6

GS of STG Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
36	69	56.655	6.592	.	.

Figure 3


Correlation of GS with GPA
for STG Graduates
GPA
102.5
100
97.5
95
92.5
90
87.5
85
82.5
80
77.5
75
35
40
45
50
55
60
65
70
75
GS

• There is a positive relationship between the ASVAB score of **Arithmetic Reasoning (AR)** and final GPA in Sonar Technician (Surface) "A" School.

Table 7

AR of STG Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
36	62	54.317	6.298	.192	4.071

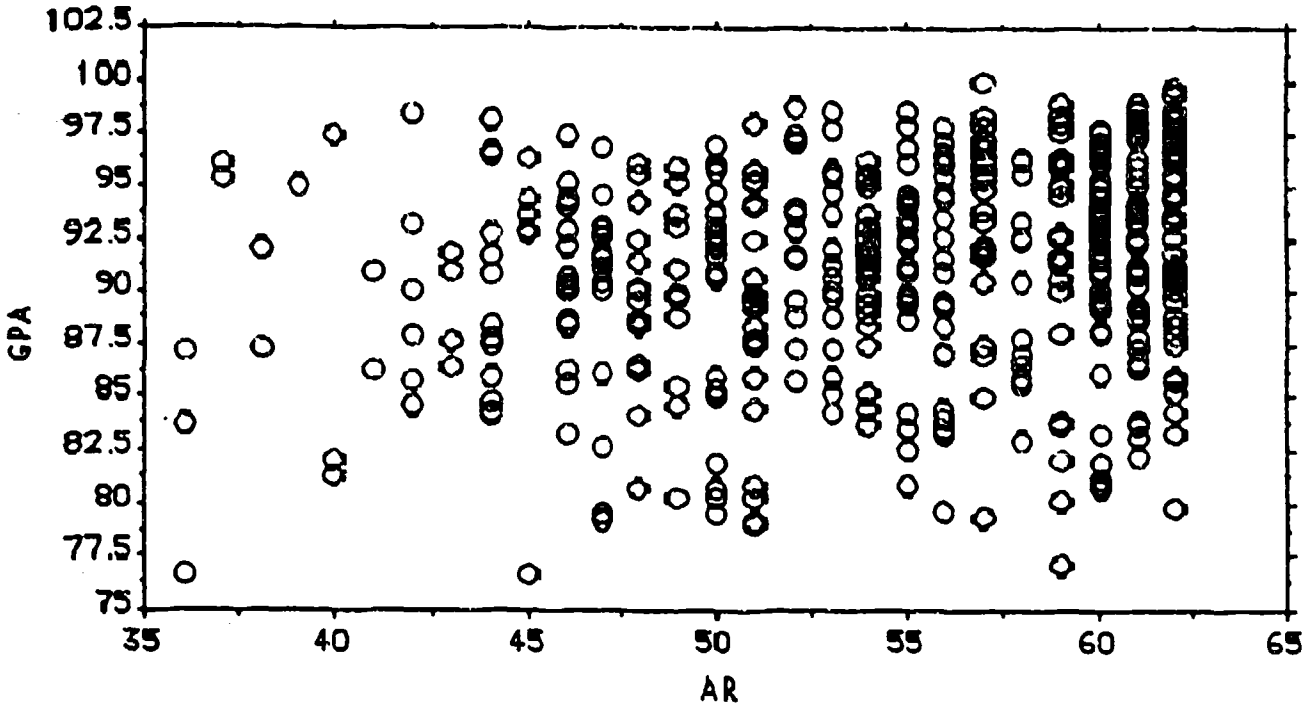
Table 8

AR of STG Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
41	62	52.724	6.352	•	•

Figure 4

Correlation of AR with GPA
for STG Graduates



• There is a positive relationship between the ASVAB composite score of **Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + GS)** and final GPA in Sonar Technician (Surface) "A" School.

Table 9

MK + EI + GS of STG Graduates

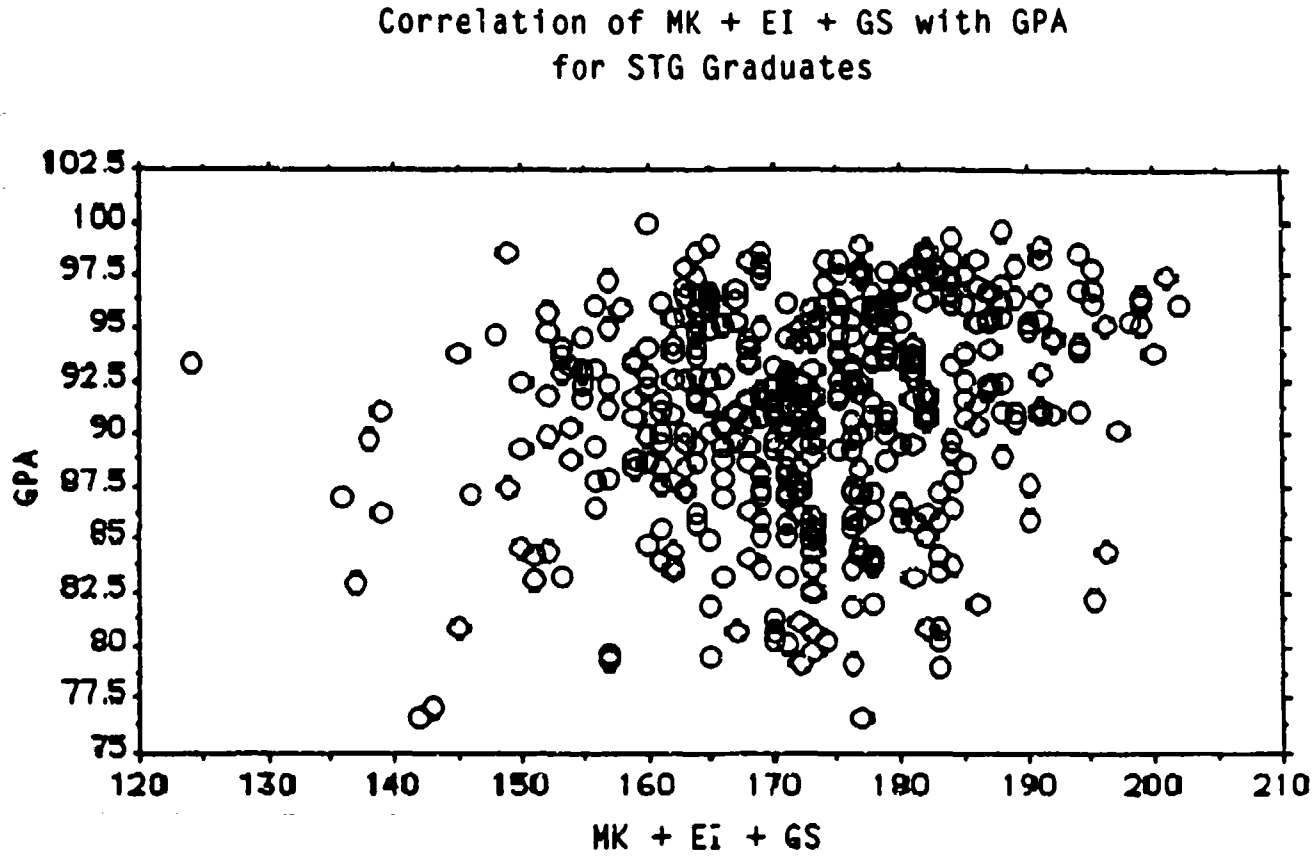
Min	Max	Mean	Std Dev	Corr (r)	t
124	202	172.386	12.277	.223	4.761

Table 10

MK + EI + GS of STG Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
128	195	165.931	12.089	•	•

Figure 5


Correlation of MK + EI + GS with GPA
for STG Graduates
GPA
102.5
100
97.5
95
92.5
90
87.5
85
82.5
80
77.5
75
120
130
140
150
160
170
180
190
200
210
MK + EI + GS

• There is a positive relationship between the ASVAB composite score of **Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR)** and final GPA in Sonar Technician (Surface) "A" School.

Table 11

MK + EI + GS + AR of STG Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
178	262	226.703	14.589	.271	5.857

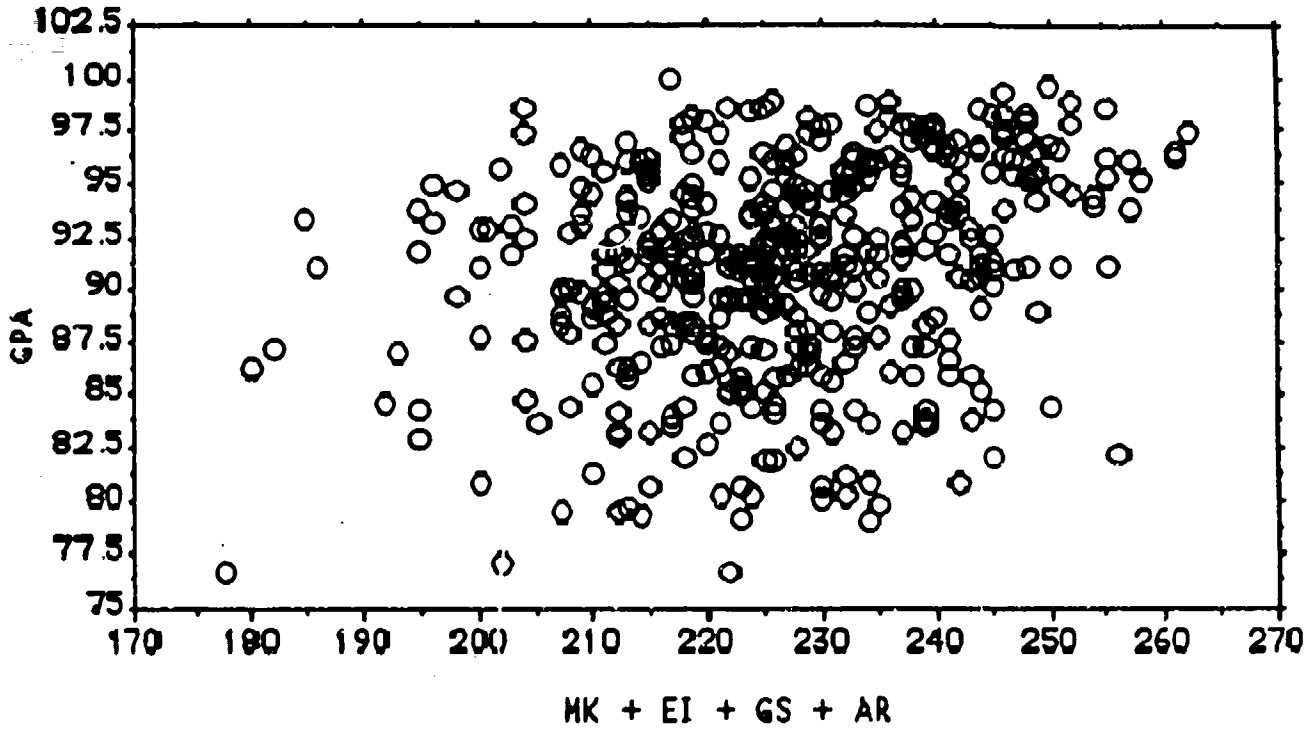
Table 12

MK + EI + GS + AR of STG Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
179	247	218.655	13.334	•	•

Figure 6

Correlation of MK + EI + GS + AR with GPA
for STG Graduates



Findings (STS)

The findings will be reported by hypothesis.

- There is a positive relationship between the ASVAB score of **Mathematics Knowledge (MK)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 13

MK of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
36	69	58.66	6.451	.122	2.558

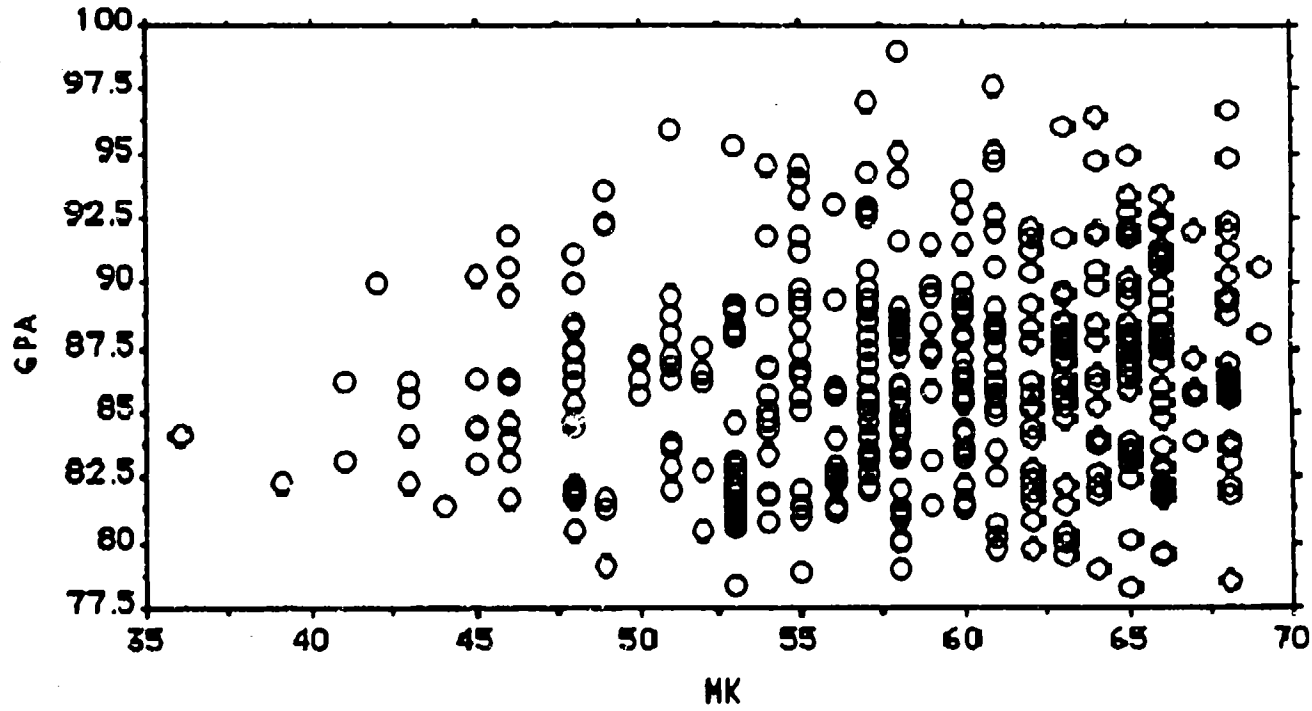
Table 14

MK of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
37	68	56.091	8.428	.	.

Figure 7

Correlation of MK with GPA
for STS Graduates



• There is a positive relationship between the ASVAB score of **Electronics Information (EI)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 15

EI of STS Graduates

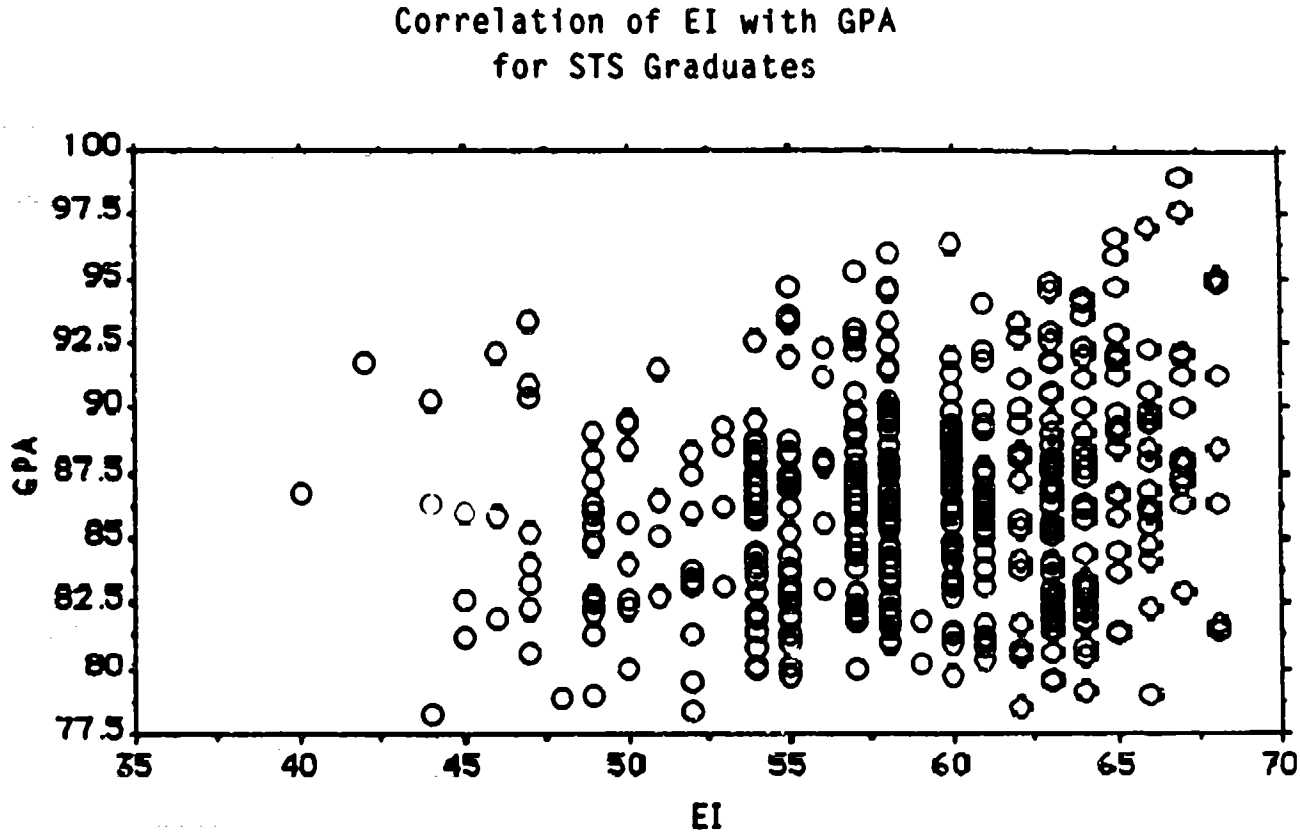
Min	Max	Mean	Std Dev	Corr (r)	t
40	68	58.878	5.45	.201	4.269

Table 16

EI of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
47	66	58.364	5.645	•	•

Figure 8


Correlation of EI with GPA
for STS Graduates
GPA
100
97.5
95
92.5
90
87.5
85
82.5
80
77.5
35
40
45
50
55
60
65
70
EI

• There is a positive relationship between the ASVAB score of **General Sciences (GS)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 17

GS of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
43	70	59.308	5.565	.066	1.376

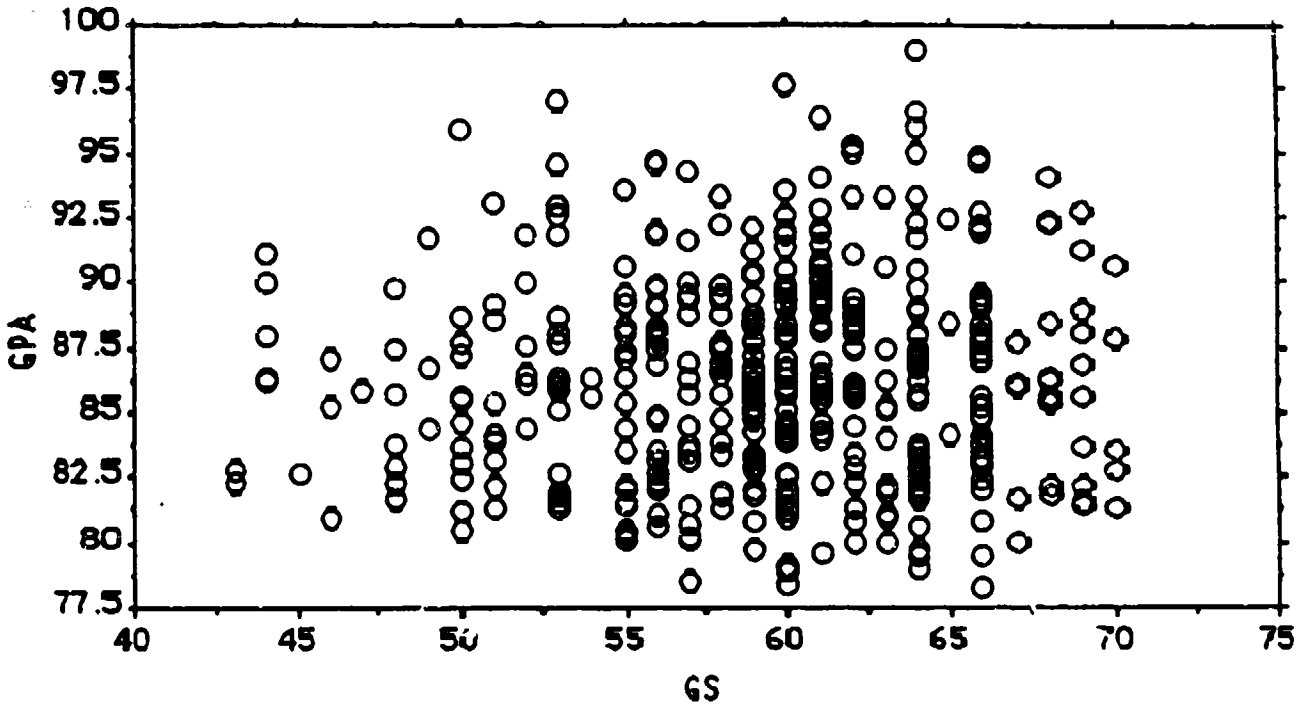
Table 18

GS of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
50	69	57.727	5.082	•	•

Figure 9

Correlation of GS with GPA
for STS Graduates



- There is a positive relationship between the ASVAB score of **Arithmetic Reasoning (AR)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 19

AR of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
24	62	54.968	6.402	.054	1.125

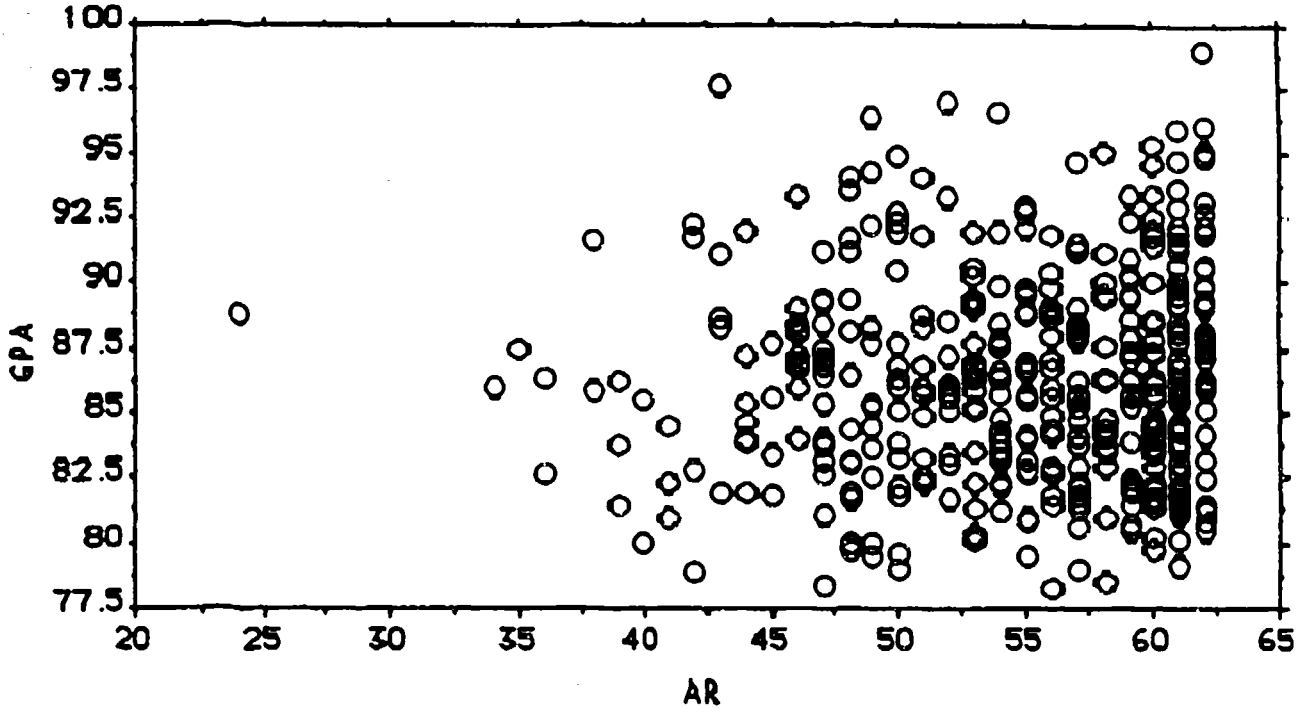
Table 20

AR of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
42	62	53.682	5.752	.	.

Figure 10

Correlation of AR with GPA
for STS Graduates



- There is a positive relationship between the ASVAB score of **Word Knowledge (WK)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 21

WK of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
39	62	55.618	4.234	.224	4.782

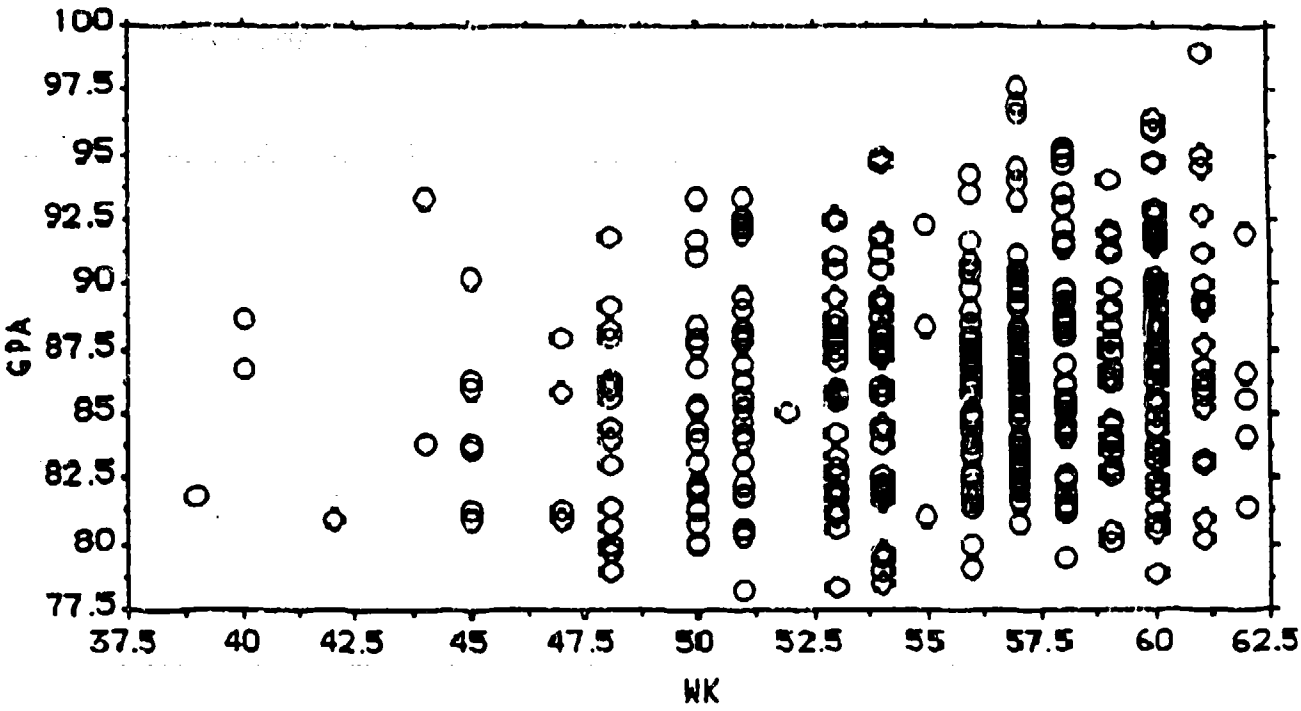
Table 22

WK of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
42	61	54.5	5.334	.	.

Figure 11

Correlation of WK with GPA
for STS Graduates



• There is a positive relationship between the ASVAB score of **Mechanical Comprehension (MC)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 23

MC of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
40	70	60.136	5.744	.215	4.580

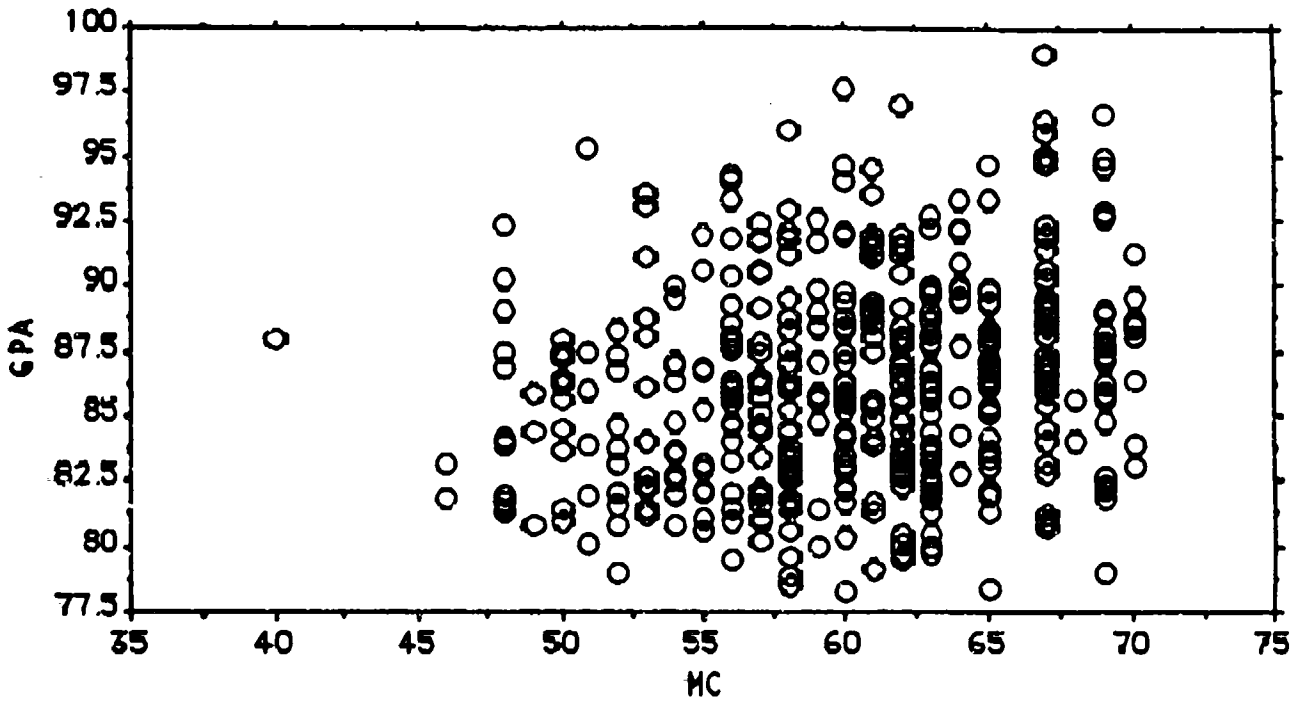
Table 24

MC of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
46	68	56.545	5.217	•	•

Figure 12

Correlation of MC with GPA
for STS Graduates



• There is a positive relationship between the ASVAB composite score of **Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + GS)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 25

MK + EI + GS of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
145	205	176.846	11.002	.204	4.337

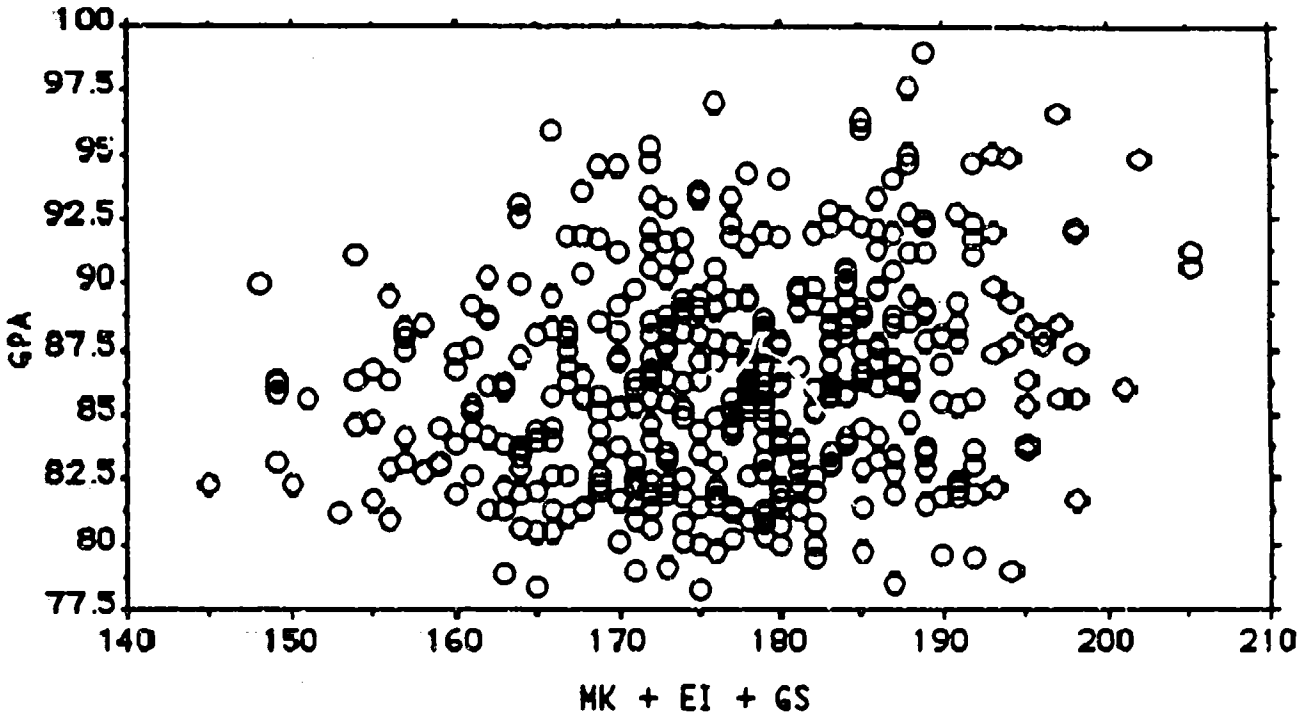
Table 26

MK + EI + GS of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
151	197	172.182	12.176	•	•

Figure 13

Correlation of MK + EI + GS with GPA
for STS Graduates



• There is a positive relationship between the ASVAB composite score of **Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR)** and final GPA in Sonar Technician (Submarine) "A". School.

Table 27

MK + EI + GS + AR of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
186	266	231.814	12.923	.201	.4.269

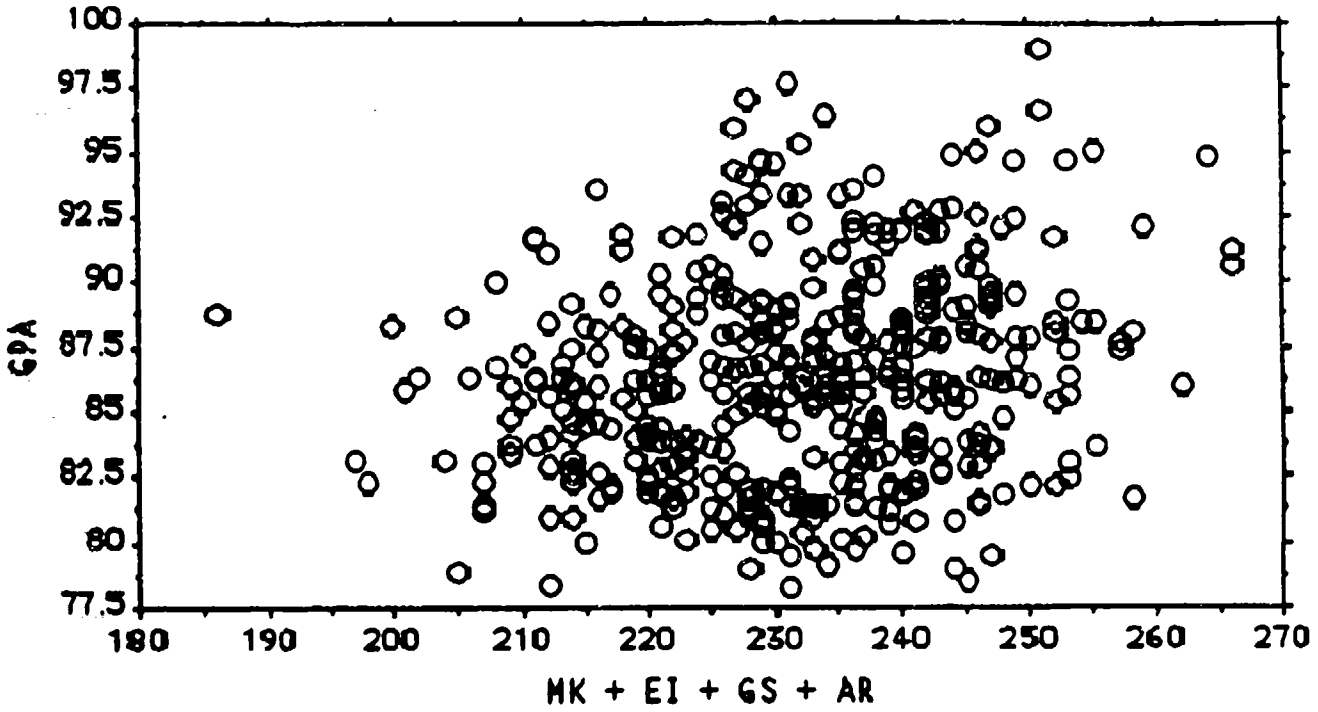
Table 28

MK + EI + GS + AR of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
197	252	225.864	12.852	•	•

Figure 14

Correlation of MK + EI + GS + AR with GPA
for STS Graduates



- There is a positive relationship between the ASVAB composite score of **Word Knowledge + Arithmetic Reasoning + Mechanical Comprehension (WK + AR + MC)** and final GPA in Sonar Technician (Submarine) "A" School.

Table 29

WK + AR + MC of STS Graduates

Min	Max	Mean	Std Dev	Corr (r)	t
136	192	170.722	10.362	.244	5.234

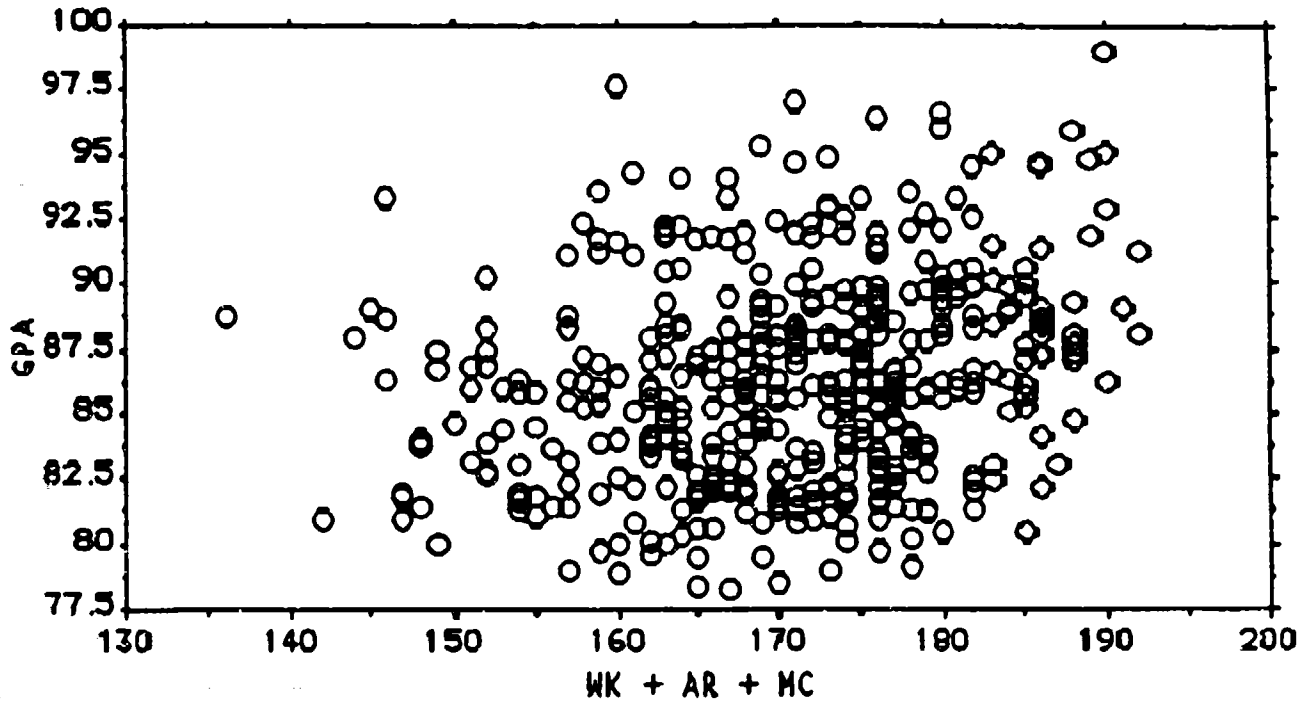
Table 30

WK + AR + MC of STS Academic Drops

Min	Max	Mean	Std Dev	Corr (r)	t
143	181	164.72	10.329	.	.

Figure 15

Correlation of WK + AR + MC with GPA
for STS Graduates



Analysis of Sonar Technician (Surface) Data

The ASVAB score of Mathematics Knowledge (MK) produced a correlation coefficient (r) of 0.008 when compared to final GPA for STG "A" School. This translated to a t-statistic of 0.166. According to Ary (1990), at the .01 significance level, a t of 0.166 indicated that there was no relationship between MK score and final GPA for STG "A" School.

The ASVAB score of Electronics Information (EI) produced a correlation coefficient of 0.326 when compared to final GPA for STG "A" School, with t = 7.178. At the .01 significance level, a t of 7.178 indicated that there was a statistically significant predictive correlation between EI score and final GPA for STG "A" School.

The ASVAB score of General Sciences (GS) produced a correlation coefficient of 0.117 when compared to final GPA for STG "A" School. with t = 2.452. At the .01 significance level, a t of 2.452 indicated that there was a statistically significant predictive correlation between GS score and final GPA for STG "A" School.

The ASVAB score of Arithmetic Reasoning (AR) produced a correlation coefficient of 0.192 when compared to final GPA for STG "A" School, with t = 4.071. At the .01 significance level, a t of 4.071 indicated that there was a statistically significant predictive correlation between AR score and final GPA for STG "A" School.

The composite ASVAB score of Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + AR) produced a correlation coefficient of 0.223 when compared to final GPA for STG "A" School, with t = 4.761. At the .01 significance level, a t of 4.761 indicated that there was a statistically significant predictive correlation between MK + EI + AR composite score and final GPA for STG "A" School.

The ASVAB score of Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR) produced a correlation coefficient of 0.271 when compared to final GPA for STG "A" School, with t = 5.857. At the .01 significance level, a t of 5.857 indicated that there was a statistically significant predictive correlation between MK + EI + GS + AR composite score and final GPA for STG "A" School.

For each subtest and composite score, the mean score for STG graduates was slightly greater than the mean score for the academic drops. Each group had minimum scores below the published minimum requirement for selection to STG "A" School, but their mean scores were all above the published requirement.

Analysis of Sonar Technician (Submarine) Data

The ASVAB score of Mathematics Knowledge (MK) produced a correlation coefficient of 0.122 when compared to final GPA for STS "A" School, with t = 2.558. At the .01 significance level, a t of 2.558 indicated that there was no relationship between MK score and final GPA for STS "A" School.

The ASVAB score of Electronics Information (EI) produced a correlation coefficient of 0.201 when compared to final GPA for STS "A" School, with t = 4.269. At the .01 significance level, a t of 4.269 indicated that there was a statistically significant predictive correlation between EI score and final GPA for STS "A" School.

The ASVAB score of General Sciences (GS) produced a correlation coefficient of 0.066 when compared to final GPA for STS "A" School, with t = 1.376. At the .01 significance level, a t of 1.376 indicated that there was no relationship between GS score and final GPA for STS "A" School.

The ASVAB score of Arithmetic Reasoning (AR) produced a correlation coefficient of 0.054 when compared to final GPA for STS "A" School, with t = 1.125. At the .01 significance level, a t of 1.125 indicated that there was no relationship between AR score and final GPA for STS "A" School.

The ASVAB score of Word Knowledge (WK) produced a correlation coefficient of 0.224 when compared to final GPA for STS "A" School, with t = 4.782. At the .01 significance level, a t of 4.782 indicated that there was a statistically

The ASVAB score of Word Knowledge (WK) produced a correlation coefficient of 0.224 when compared to final GPA for STS "A" School, with t = 4.782. At the .01 significance level, a t of 4.782 indicated that there was a statistically significant predictive correlation between WK score and final GPA for STS "A" School.

The ASVAB score of Mechanical Comprehension (MC) produced a correlation coefficient of 0.215 when compared to final GPA for STS "A" School, with t = 4.580. At the .01 significance level, a t of 4.580 indicated that there was a statistically significant predictive correlation between MC score and final GPA for STS "A" School.

The ASVAB score of Mathematics Knowledge + Electronics Information + General Sciences (MK + EI +GS) produced a correlation coefficient of 0.204 when compared to final GPA for STS "A" School, with t = 4.337. At the .01 significance level, a t of 4.337 indicated that there was a statistically significant predictive correlation between MK + EI + GS composite score and final GPA for STS "A" School.

The ASVAB score of Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR) produced a correlation coefficient of 0.201 when compared to final GPA for STS "A" School, with t = 4.269. At the .01 significance level, a t of 4.269 indicated that there was a statistically significant predictive correlation between MK + EI + GS + AR composite score and final GPA for STS "A" School.

significance level, a t of 5.234 indicated that there was a statistically significant predictive correlation between WK + AR + MC composite score and final GPA for STS "A" School.

For each subtest and composite score, the mean score for STS graduates was slightly greater than the mean score for the academic drops. Each group had minimum scores below the published minimum requirement for selection to STS "A" School, but their mean scores were all above the published requirement.

Summary

Six ASVAB scores were correlated to final grade point average for STG "A" School, using 435 sets of data. Of these ASVAB scores, four provided statistically significant predictive validity of "A" School success at a .01 significance level. The predictor scores were the subtests Electronics Information (EI) and Arithmetic Reasoning (AR), and the composite scores Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + GS) and Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR). The Mathematics Knowledge and General Sciences subtests indicated no relationship to STG "A" School success on their own.

Nine ASVAB scores were correlated to final grade point average for STS "A" School, again using 435 sets of data. Of these ASVAB scores, six provided statistically significant predictive validity of "A" School success at a

Nine ASVAB scores were correlated to final grade point average for STS "A" School, again using 435 sets of data. Of these ASVAB scores, six provided statistically significant predictive validity of "A" School success at a .01 significance level. The predictor scores were the subtests Electronics Information (EI), Word Knowledge (WK), and Mechanical Comprehension (MC), and the composite scores Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + GS), Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR), and Word Knowledge + Arithmetic Reasoning + Mechanical Comprehension (WK + AR + MC). The subtests Mathematics Knowledge (MK), General Sciences (GS), and Arithmetic Reasoning (AR) indicated no relationship to STS "A" School success on their own.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study's findings supported the predictive validity of ASVAB composite scores for academic success in both the surface and submarine versions of Sonar Technician "A" School. The composite scores of Mathematics Knowledge + Electronics Information + General Sciences (MK + EI + GS), Mathematics Knowledge + Electronics Information + General Sciences + Arithmetic Reasoning (MK + EI + GS + AR), and (for STS School only) Word Knowledge + Arithmetic Reasoning + Mechanical Comprehension (WK + AR + MC) all indicated statistically significant correlation with final GPA for "A" School.

In addition, selected subtests also demonstrated significant predictive validity. For STG "A" School, the Electronics Information (EI) and Arithmetic Reasoning (AR) subtests indicated statistically significant correlation. For STS "A" School, the Electronics Information (EI), Word Knowledge (WK), and Mechanical Comprehension (MC) subtests were statistically significant.

Correlations could not be not calculated for academic drops from either school, since no GPAs were available for those students. Only slight differences existed between the mean scores for the ASVAB subtests and composite scores, comparing graduates with academic drops. In all cases, the academic drops had slightly lower scores as a group than did

the graduates. All the mean scores were all above the published requirement for selection to Sonar Technician "A" School, but each group had minimum scores below the published minimum requirement. This indicates that waivers were granted to members in both groups.

Recommendations

- The Navy should continue to use ASVAB composite scores as part of their criteria for selecting students for Sonar Technician "A" School.
- Further research should be conducted into the differences in ASVAB scores between Sonar Technician "A" School graduates and academic drops. Recording a student's GPA at the time of disenrollment would facilitate such a study.

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ABSTRACT

This correlational research examined the relationship between Armed Services Vocational Aptitude Battery (ASVAB) scores and final grade point average (GPA) in the Navy's Sonar Technician surface (STG) and submarine (STS) "A" Schools. ASVAB scores are currently used as the major selection criteria for these schools. Between October 1989 and October 1991 approximately 1500 students either graduated or were dropped for academic reasons from STG and STS "A" School. They were all males and their ages at class convening time ranged from 19 to 36 years. For this study, 435 subjects were randomly selected from the graduates of each school. All academic drops for that time period were used as well (29 STG and 22 STS). Final GPAs were collected from the class rosters and ASVAB scores were retrieved from the Navy's Source Data System. Distribution data of ASVAB scores were compared for graduates and academic drops. The graduates' scores were also analyzed using the Pearson Product-Moment Correlation Coefficient and the t-statistic. The findings indicated that the composite ASVAB scores currently used are statistically significant predictors of academic success in ST "A" School.